55-2320-238-20-1

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TRANSPORTABILITY GUIDANCE RECOVERY VEHICLE, FULL-TRACKED LIGHT-ARMORED, M578

Headquarters, Department of the Army, Washington, D.C.

27 March 1967

	Paragraph	Page
Purpose and scope	1	1
Description	2	1
Modes of transport	3	1
Sectionalization	4	5
Item characteristics and related data	5	5
Appendix A. Air Transportability Guidance	--	7
B. Rail Transportability Guidance	--	11

1. Purpose and Scope

a. This manual provides transportability guidance for movement of the Recovery Vehicle, Full-Tracked, Light-Armored, M578 (fig. 1). It covers significant transportability and safety considerations in the movement of the item by the various modes of transport. Included are side- and end-elevation drawings (figs. 2 and 3) and characteristics of the item.

b. Users of this manual are encouraged to submit recommended changes and comments for its improvement. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded direct to the Commanding Officer, U. S. Army Transportation Engineering Agency, Military Traffic Management and Terminal Service, ATTN: MTT-TG, Fort Eustis, Va., 23604.

2. Description

The M578 recovery vehicle is a low-silhouette, full-tracked, light-armored vehicle designed to pick up or tow a disabled vehicle from a field of operation. It is powered by a diesel engine. The boom, boom winches, and vehicle towing winch are powered by hydraulic motors driven off the main engine. The boom will traverse a full 360°, enabling the vehicle to be used as a crane. The crew consists of a driver, crane operator, and rigger.

3. Modes of Transport

(Figures in parentheses throughout this manual are metric equivalents.)

a. Shipment by Air.

(1) The item is not transportable by U.S. Army aircraft.

(2) Based on a typical logistical mission of 2,500 nautical miles (4630 km), one way, the item is within the dimensional and weight capabilities of the C-133 series U.S. Air Force aircraft.

(3) Based on a typical logistical mission of 1,000 nautical miles (1825 km), one way, the item is within the dimensional and weight capabilities of the C-124 and C-133 series U.S. Air Force aircraft.

Note. The maximum U.S. Air Force aircraft cargo weight and range capabilities are based on the following conditions:

Standard day conditions

D 101.11:

READEX FICHE best copy available

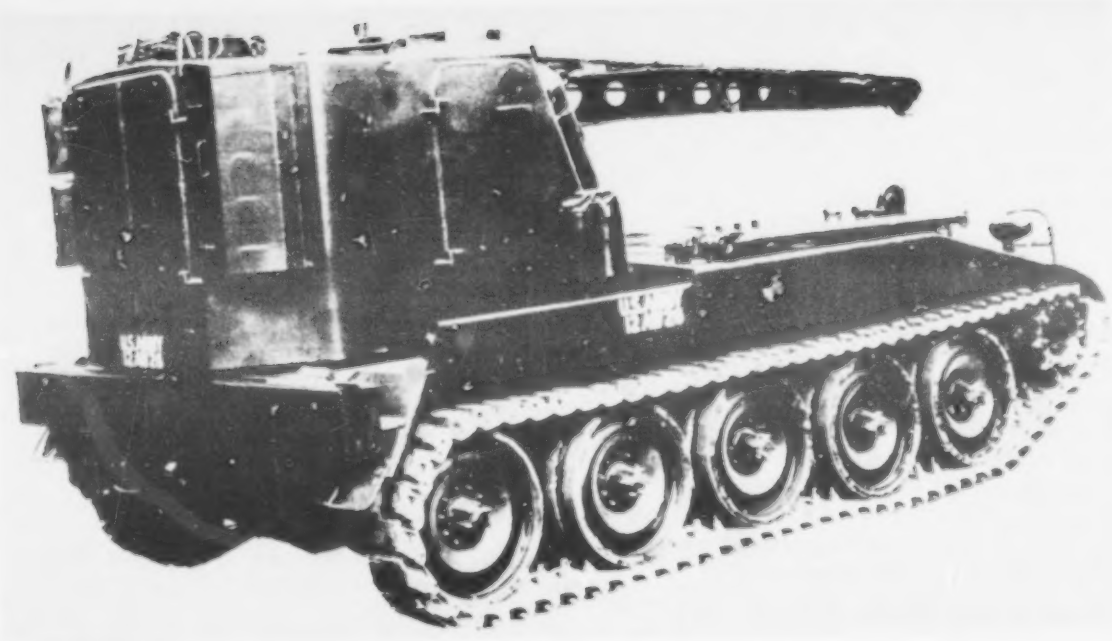


Figure 1. Recovery vehicle, full-tracked, light-armored, M578.

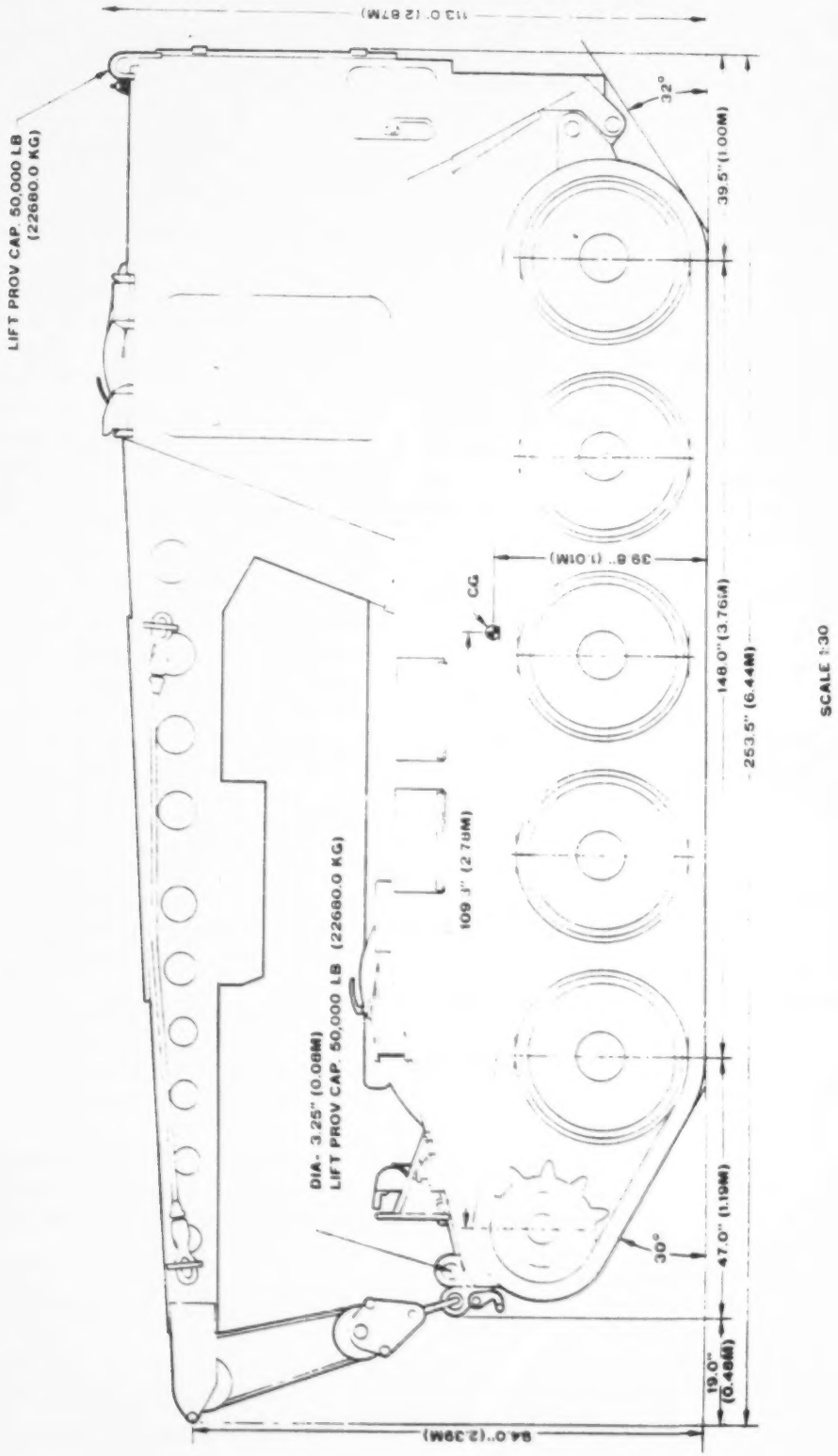
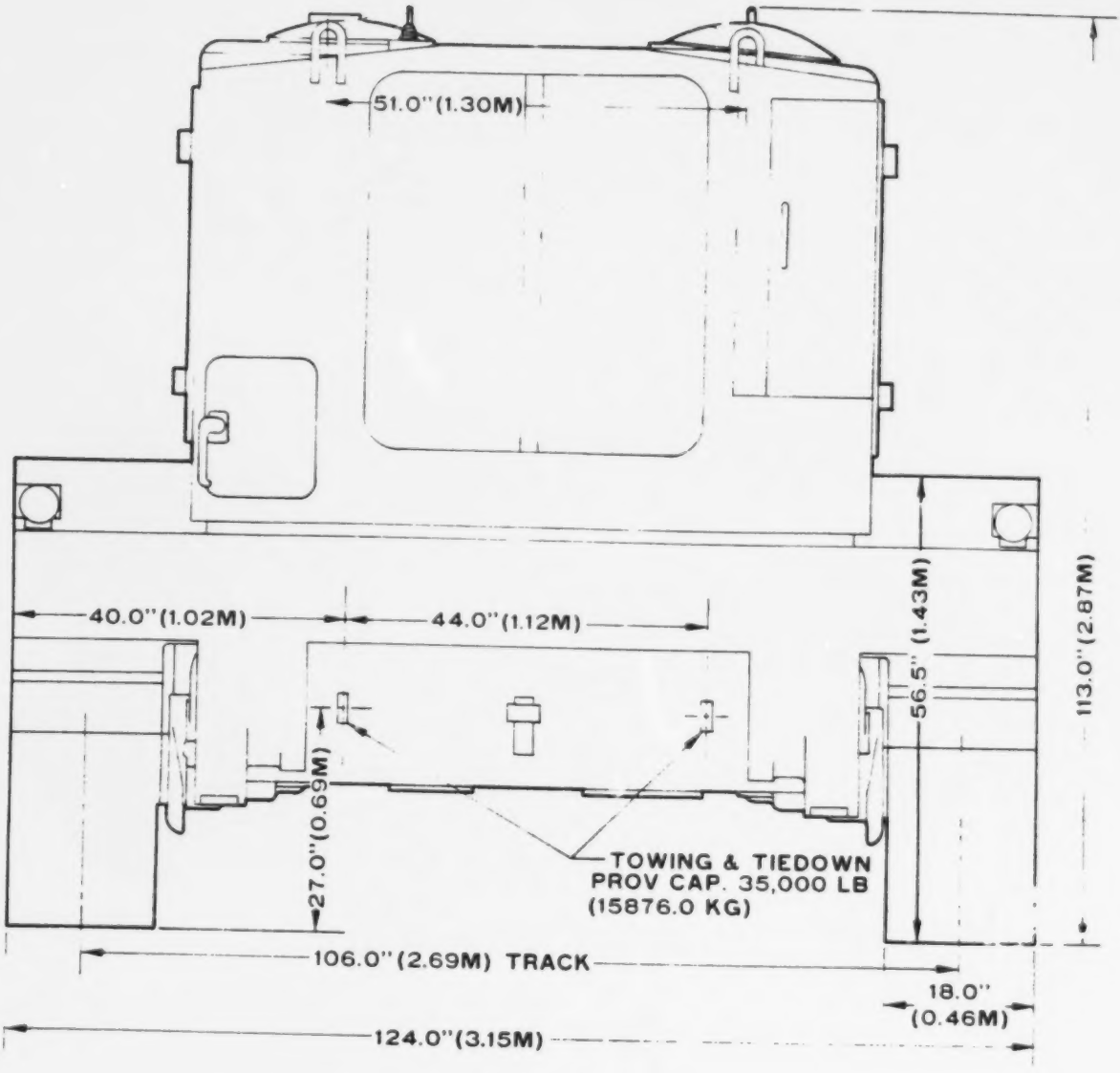


Figure 2. Side elevation.



SCALE 1:20

Figure 3. End elevation.

Sea level operating conditions
Hard-surfaced runways
No weather alternate required
No wind conditions
Fuel reserve
Constant cruising altitude

In the event one or more of these operating conditions are changed, the maximum cargo load and/or range may be affected.

(4) Appendix A prescribes detailed procedures for loading, restraining, and off-loading the item in the C–124 series U. S. Air Force aircraft. Procedures for loading into other aircraft have not been tested.

b. Shipment by Highway.

(1) *On road.* The item is transportable by highway under its own power or when loaded on a semitrailer; however, movement over public highways in CONUS should be made only when other modes of transport cannot be used. Normally, highway shipments are made with the item loaded on military or commercial low-bed semitrailers of adequate capacity. When moving under its own power, or when loaded on a semitrailer, the item exceeds the legal width limitations in CONUS and the recommended width limitations in overseas areas. When loaded on semitrailers, the item may also exceed the height limitations in CONUS and overseas. Special permits will be required in CONUS, and special routing may be required overseas.

(2) *Off road: soils trafficability data.* The vehicle cone index (VCI) is a number which tests have proven can be related to the characteristics of a particular vehicle. This number, when used in connection with the rating cone index (of the soil), can forecast the ability of that vehicle to repeatedly cross fine-grained soil, and sands with fines poorly drained. The rating cone index is obtained by use of the cone penetrometer and its associated equipment. See TB ENG 37 for use of the equipment in the field and for interpretation of index numbers. See paragraph 5 for the item VCI number.

c. Shipment by Rail. The item loaded on a railroad flatcar is transportable within the "Outline Diagram for Single Loads, Without End Overhang, on Open Top Cars"* for shipments within CONUS. See appendix B for information regarding blocking and restraining on railroad flatcars. In countries complying with the Berne International Rail Interchange Agreement verification of line clearances may be required. The height and width of the item with Closure Kit installed are such that special routing and/or restricted movement may be required.

d. Shipment by Water. The item is transportable by inland waterway cargo carriers and lighters of adequate capacity. It can be shipped by Mariner, Victory, and Liberty class seagoing vessels, subject to the following limitations:

Class	*Hatch size adequate*	*Hatch boom adequate*	*Hatches requiring terminal crane*
Mariner	All	Nos. 4, 6	Nos. 1, 2, 3, 5, 7
Victory	All	Nos. 3, 4	Nos. 1, 2, 5
Liberty	All	No. 2	Nos. 1, 3, 4, 5

4. Sectionalization

Sectionalization of the item is not required.

5. Item Characteristics and Related Data

(Data based on item in operational condition.)

Nomenclature—Recovery Vehicle, Full-Tracked, Light-Armored, M578.

FSN	2320–439–6242
LIN	R50543
Type Classification	Standard A
Item Weight:	
Unloaded	47,000 lb (21319 kg)
With Combat Load	54,000 lb (24494 kg)

* Detailed information available in *Railway Line Clearances* publication.

Ground Pressure:	
Unloaded	8.7 psi (0.62 kg/sq cm)
With Combat Load	10.1 psi (0.71 kg/sq cm)
Center of Gravity:	
Above Ground	39.8 inches (1.01 m)
From C/L Drive Sprocket	109.3 inches (2.78 m)
Angle of Approach	30°
Angle of Departure	32°
Item Dimensions.	
Without Closure:	
Length	253.5 inches (6.44 m)
Width	124 inches (3.15 m)
Height	113 inches (2.87 m)
With Closure:	
Length	259.5 inches (6.59 m)
Width	126 inches (3.20 m)
Height	116 inches (2.95 m)
Shipping Dimensions.	
Without Closure:	
Volume	2,055.6 cu ft (58.17 cu m)
Area	218.3 sq ft (20.28 sq m)
With Closure:	
Volume	2,194.9 cu ft (62.12 cu m)
Area	227.1 sq ft (21.09 sq m)
Turning Radii (R&L)	Pivot
Vehicle Classification	25
Soils Trafficability Data (para 3b (2)):	
Recovery Vehicle, M578, at combat weight	VCI 57
CONUS Freight Classification	Army Tractor Tanks, without guns.
Uniform Freight Classification (UFC)	Item 72770
National Motor Freight Classification (NMFC)	Item 145720
Publications	TM 9-2320-238-10 TM 9-2320-238-20 TB ENG 37

APPENDIX A
AIR TRANSPORTABILITY GUIDANCE

1. Applicability

The instructions in this appendix are prescribed when the recovery vehicle ("item") is the entire cargo of the C–124 series aircraft and is located as shown on the loading diagram, figure 4. For operational reasons or to accommodate additional cargo, the aircraft commander may designate a location other than that shown in the loading diagram. If the item is relocated, the aircraft commander must insure that the number and type of tiedown devices and tiedown fittings are as prescribed in this manual and that the tiedown devices and tiedown fittings are secured in the same locations relative to those shown on the loading diagram.

2. Responsibilities

a. Transported Unit Commander.

(1) Prepare item for air transport with supervision and assistance as required from appropriate field support units.

(2) Load, tie down, restrain, and off-load the item transported aboard the aircraft, subject to approval by the aircraft commander or his authorized representative. Such approval is to insure that loading, tiedown, restraint, and off-loading are accomplished as prescribed by this manual.

(3) Effect advance coordination with the transporting unit, to include a request for the tiedown devices required.

(4) Provide manpower and the necessary equipment and materials needed to prepare, load, restrain, and off-load the item.

(5) Provide guidance to the aircraft commander relative to security, safety, and any technical peculiarities of the item which may affect its safe and reliable air transport.

b. Transporting Unit Commander.

(1) Supply a sufficient quantity of the type of tiedown devices requested.

(2) Operate aircraft-associated equipment, and monitor loading, tiedown, restraint, and off-loading procedures to insure compliance with this manual.

(3) Inspect the aircraft for serviceability appropriate to the mission, and comply with pertinent aviation directives and maintenance manuals.

3. Preparation and Loading

a. Equipment and Materials.

(1) Wrecker, M62, or equal (winching vehicle).

(2) Truck, 2½-ton, 6x6, with winch, M35, or equal (counterweight or for off-loading only).

(3) Two chock blocks.

(4) Shoring, 2- by 12-inch by approximately 320 linear feet, as required.

(5) One clevis, 1⅛-inch pin diameter (usually organic to aircraft).

(6) One chain from D–1 tiedown device (organic to aircraft) for use as safety chain.

(7) Two snatch blocks.

(8) Three hundred feet of ¾-inch cable (organic to aircraft).

b. Procedures.

(1) Lock the recovery vehicle's crane cab and boom in travel position.

(2) Engage the hoist hook in the center towing eye, and run the hoist cable up taut.

(3) Hoist the rear spade to the travel position, and secure it with the spade manual lock.

(4) Remove, for separate stowage in the aircraft, the *on vehicle materiel* (OVM), consisting of machine gun, cradle and mount, jack, oxygen tank, acetylene tank, spare track shoe, mechanic's tool set, snatch block assembly, filled 5-gallon cans, ammunition, tow bar, and track-connecting fixtures. Assure that fuel tank is less than half full (approximately 60 gallons).

(5) Back the item to the toe of the ramp, assuring that the center of the item is precisely aligned with the center of the aircraft cargo compartment.

(6) Locate one of the aircraft snatch blocks at station 1117 on center of the cargo compartment. Locate the second aircraft snatch block at station 1117 positioned so that cable will be along the right wall of cargo compartment. This cable must be close to, but not contact, the wall.

(7) Lay two rows of 2- by 12-inch shoring from toe of nose ramp, continuously to station 690. Lay each row two boards wide so that item tracks will ride on the shoring.

(8) Connect one end of the ¾-inch cable to the item's tow pintle. Rig a safety chain by passing a D–1 tiedown device chain through the cable clevis and the item's right and left towing provision eyes. Pull the chain to a tight loop, and secure it with the chain hook. Reeve the cable part connected to the item around the center snatch block, across to the snatch block near the right wall, and extend it over the ramp to its full length.

(9) Locate the M62 wrecker with its winch cable in line with the right-hand section of the aircraft cable. Connect the aircraft cable and the M62 cable end-to-end with the 1⅛-inch pin diameter clevis.

Caution: **Use of clevis instead of cable hook is a safety measure, since the winch towing-cable hook has an open throat, and accidental detachment might occur if the hook were used.**

(10) Release the M62 winch, and back the vehicle until approximately 40 feet of cable has been run out.

(11) Station two guides inside the aircraft to observe clearance on each side of the item. Station one guide in front of the item to signal the item operator and the winch operator.

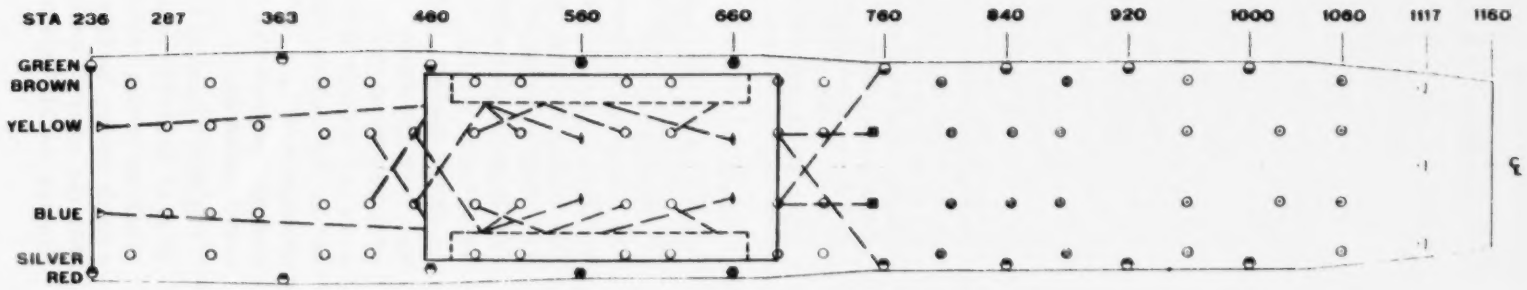
Caution: **If the aircraft cable scrapes or drags along the aircraft inner wall, the wall may become seriously damaged. Therefore, the guides must continuously check during the loading operation to give warning if the cable comes in contact with the aircraft inner wall.**

(12) Station one man alongside the front of each track with a chock block. Chock blocks are to be kept close under each track while the item is on the ramp to prevent the item from rolling back in the event of a mechanical failure. As directed by the front guide, the item driver maintains directional control and is ready at all times to apply brakes. Winch the item slowly into the aircraft to its restraint position with the rear of the spade face at station 690.

Caution: **Because of the structural limitation of aircraft components, pulling force in winching/towing cables must not exceed 30,000 pounds during loading and off-loading.**

(13) Lower the aircraft loading-well platform to the hardstand, and load the OVM onto the platform. Raise the platform into flight position. Pile extra shoring in the aircraft, and secure it as directed by the aircraft commander or load master.

c. Restraint. Restrain the item in accordance with figure 4 and table 1. Figure 4 shows the location of the item and its restraint pattern. Table 1 lists the tiedown devices required, the location of the tiedown points on the item, and the corresponding fittings to which the devices are secured. Restrain the OVM with approxi-



SYMBOL	⊙	◎	○	◓	●	◁	▷	◊	■
STRENTH OF FITTING AND BASIC LOAD DIRECTION	5,000 LB ANY	10,000 LB ANY	15,000 LB ANY	35,000 LB VERTICAL OR SIDE	50,000 LB VERTICAL OR SIDE	30,000 LB FORWARD	50,000 LB AFT	35,000 LB ANY	35,000 LB ANY	20,000 LB ANY

Description of item	Item facing	Location of reference point		Location of CG	Approx wt (lb)
		Reference point	Station		
Recovery vehicle, full-tracked, light-armored, M578, unloaded	Forward	Rear face spade	690	Sta 575	47,000
Accessory removed equipment	NA	Ctr of platform	840	Sta 840	1,600

Figure 4. Loading diagram for M578 recovery vehicle in C–124-series aircraft.

mately 12 MC–1 tiedown straps at the direction of the load master. Most of these straps will be attached to the 1,250-pound cargo tiedown fittings. These fittings are not shown in the C–124 tiedown template; therefore, the tiedown pattern is not shown in figure 4.

Table 1. Tiedown Data for M578 Recovery Vehicle in C–124-Series Aircraft

Tiedown device			Tiedown fitting
Station No.	Capacity in 1,000 lb	Type device*	Attach to item
Yellow 236	50	MB–2	Right front lifting provision.
Blue 236	50	MB–2	Left front lifting provision.
Yellow 421	15	MB–1	Left front towing provision.
Blue 421	15	MB–1	Right front towing provision.
Yellow 450	15	MB–1	No. 1 left road wheel arm.
Blue 450	15	MB–1	No. 1 right road wheel arm.
Yellow 490	15	MB–1	No. 2 right road wheel arm.
Blue 490	15	MB–1	No. 2 left road wheel arm.
Yellow 520	15	MB–1	No. 1 right road wheel arm.
Blue 520	15	MB–1	No. 1 left road wheel arm.
Yellow 560	35	MB–2	No. 1 right road wheel arm.
Blue 560	35	MB–2	No. 1 left road wheel arm.
Yellow 590	15	MB–1	No. 2 right road wheel arm.
Blue 590	15	MB–1	No. 2 left road wheel arm.
Yellow 620	15	MB–1	No. 5 right road wheel arm.
Blue 620	15	MB–1	No. 5 left road wheel arm.
Yellow 660	35	MB–2	No. 3 right road wheel arm.
Blue 660	35	MB–2	No. 3 left road wheel arm.
Yellow 753	20	MB–2	Right towing and tiedown provision.
Blue 753	20	MB–2	Left towing and tiedown provision.
Green 760	35	MB–2	Left towing and tiedown provision.
Red 760	35	MB–2	Right towing and tiedown provision.

* Type D–1 tiedown device may be substituted for type MB–2.
Type C–2 tiedown device may be substituted for type MB–1.

4. Off-Loading

a. Remove all restraining devices from the item and OVM.

b. Remove OVM from aircraft by means of the aircraft loading well platform.

c. Lay the shoring as in loading.

d. Assemble snatch blocks and cable as in loading.

e. Locate an M35 truck in the position taken by the M62 wrecker in loading (cable connection in line with the right-hand section of the aircraft cable.) Connect the aircraft cable and the M35 winch cable end-to-end with the 1⅛-inch pin diameter clevis.

Caution: **Use of clevis instead of cable hook is a safety measure, since the winch towing-cable has an open throat, and accidental detachment might occur if the hook were used.**

f. Release the M35 winch and back the vehicle until approximately 40 feet of cable has been run out. Engage and operate the M35 winch until the cable is taut.

g. Attach the item tow bar to the item's front left and right towing provision eyes.

h. Locate the M62 wrecker approximately 60 feet from the toe of the aircraft ramp with the M62 winch centered on the item. Connect the M62 winch cable to the lunette of the tow bar. Station guides and chock-block men as in loading.

i. With the M62 winch, slowly winch the item from the aircraft. The item driver maintains directional control as directed by the front guide and is ready at all times to apply brakes. As the item comes down the ramp, the M35 operator will apply brakes to keep a restraining load on the item and to allow the M35 to be towed forward.

Caution: **Because of the structural limitations of aircraft components, pulling force in winching/towing cables must not exceed 30,000 pounds during loading and off-loading. Insure that the aircraft cable does not contact and damage the aircraft wall.**

APPENDIX B
RAIL TRANSPORTABILITY GUIDANCE

Blocking and Restraining Item on Railroad Flatcars With Wooden Floors

1. BILL OF MATERIAL

	Quantity
a. Lumber	
2-in x 4-in	100 ft
2-in x 12-in	65 ft
b. Nails	
20d (4-in)	220
30d (4½-in)	170
c. Rope, steel wire, ⅝-in. diameter	100 ft
d. Clips, cable, ⅝-in.	20
e. Thimbles, std, ⅝-in. open type	4

2. MATERIAL SPECIFICATIONS

a. Lumber: Douglas-fir or comparable lumber with straight grain and free from material defects, Fed Spec MM–L–751.

b. Nails: Common, cement-coated, Fed Spec FF–N–105.

c. Rope: ⅝-inch, 6x19, IWRC, steel cable, Fed Spec RR–W–410.

d. Clips: "U"-bolt, Crosby, heavy-duty, or equal.

3. APPLICATION OF MATERIALS (figs. 5 and 6)

Item	*No. Required*	*Application*
A		Brake wheel clearance. Six-inch clearance required in back of, on both sides of, and above brake wheel, with 4 inches required below the wheel.
B	2	Block, track, front, right and left sides. Construct with 2-in. x 12-in. material and 20d nails. See item B, figure 6. Locate the angle ends under the right and left front tracks.
C	2	Block, track, rear, right and left sides. Construct with 2-in x 12-in material and 20d nails. See item C, figure 6. Locate the angle ends under the right and left rear tracks.
D	4	Block, end cleats, each to consist of two pieces of 2-in x 4-in x 12-in. Locate against ends of each item B and C. Nail the lower piece to the car floor with four 30d nails, and the top piece to the one below in a like manner.
E	8	Block, side cleats, 2-in x 4-in x 20-in. Locate one piece on the inside and outside of each item B and C. Nail each piece to the car floor with four 30d nails.
F	2	Track, side cleats, each to consist of two pieces of 2-in x 4-in x 144-in. Locate along the inside of each track and nail the lower piece to the car floor with sixteen 30d nails. Nail the top piece to the one below with sixteen 30d nails.
G	3	Track, side cleat spreaders, each to consist of two pieces of 2-in x 4-in x length to suit. Locate at each end and in center of item F. Nail the lower

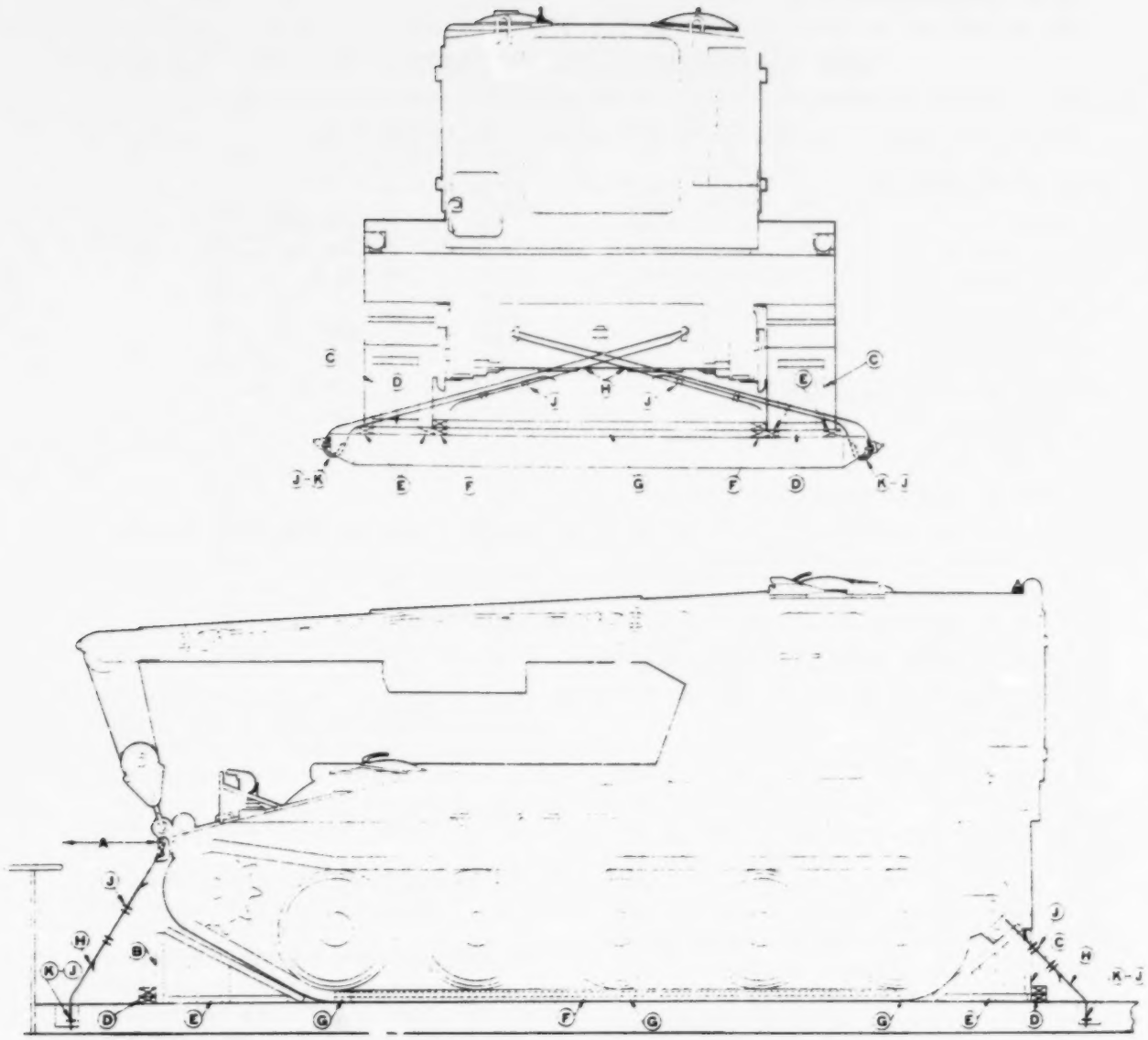
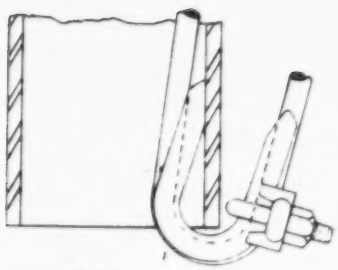
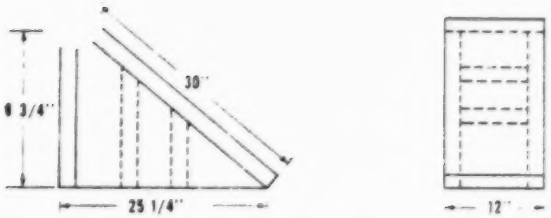


Figure 5. Blocking and restraining diagram.

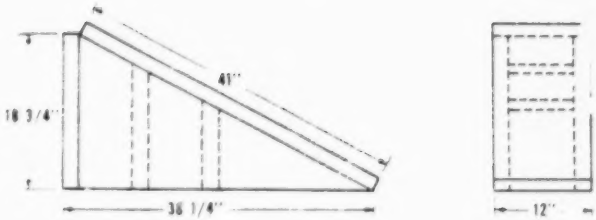


ITEM K

ITEM H



ITEM C



ITEM B

Figure 6. Blocking detail diagram.

Item	No. Required	Application
		piece to the car floor with four 30d nails. Nail the top piece to the one below with four 30d nails.
H	4	5/8-in. steel cable, doubled. Attach to the front and rear towing and tiedown provisions and to stake pockets on opposite sides of car. See figure 5.
J	20	5/8-in. cable clips. Secure the steel cable with four clips each, with one clip securing each thimble. See items H and K, figure 6.
K	4	5/8-in. thimbles. Locate one thimble under each stake pocket and secure to the cable with one clip each. See item K, figure 6.

4. GENERAL NOTES

a. Load as shown is based on a flatcar 10 ft 6 in wide (platform).

b. All handbrakes will be applied with the hand levers wired or blocked. Gearshift levers for automatic or conventional transmissions must be placed and wire-tied in neutral position. Crane cab and boom must be locked in travel position with the hoist hook engaged in the center towing eye and the hoist cable taut.

c. For further details, refer to Association of American Railroads (AAR) "Rules Governing the Loading of Commodities on Open Top Cars" and General Rules 3, 4, 5, 9, 10, 14, 15, and 19A therein.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

DCSLOG (1)
CNGB (2)
CORC (2)
CMH (2)
CofEngrs (1)
TSG (1)
Dir of Trans (5)
USAAVCOM (5)
USAMC (5)
USAWECOM (2)
ARADCOM (2)
ARADCOM Rgn (2)
OS Maj Comd (10)
4th Log Comd (5)
USA CDC Agcy (2)
USATECOM (2)
MDW (2)
Armies (5)
USA Corps (1)
29th Trans Bn (1)
Instl (2)
USCONARC (5)
Centers (2)
Arsenals (2)
Gen Dep (5)
Trans Dep (3)
Trans Sec, Gen Dep (3)
Army Dep (2)
Svc Colleges (2)
Br Svc Sch (2)
POE (2)
USA Tml Comd (2) except
USATCA (20)
Army Tml (2)
USAMEC (2)
USA Trans Engr Agcy (50)
MTMTS (6)
EAMTMTS (1)
CAMTMTS (3)
WAMTMTS (1)

NG: State AG (3).

USAR: None.

For explanation of abbreviations used see AR 320–50.

☆ U.S. GOVERNMENT PRINTING OFFICE : 1990 0 - 261-872 (30706)

PIN : 012571 - 000